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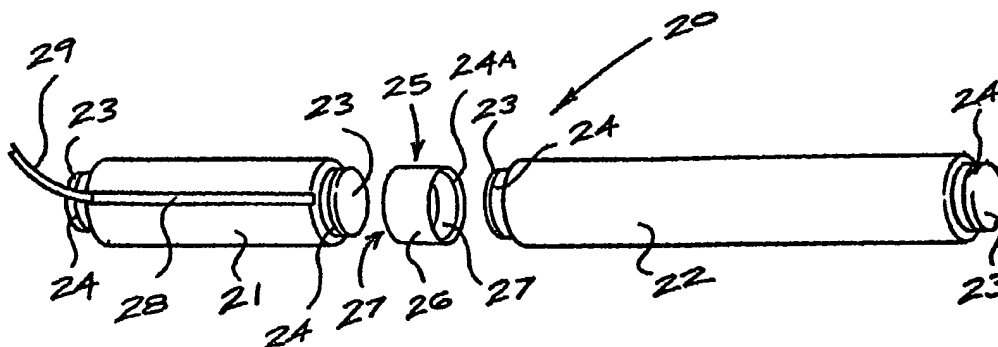
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SYSTEM WITH CONNECTABLE BLASTING CARTRIDGES



(57) Abstract: A cartridge system is provided having at least two the cartridges (21, 22) which have interlocking (24) formations enabling the cartridges to be joined end to end by a connector element (25) having complementary interlocking formations (24A).

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**SYSTEM WITH CONNECTABLE BLASTING CARTRIDGES**

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**FIELD OF THE INVENTION**

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This invention relates to a cartridge system, more particularly to a system of cartridges used for breaking or fracturing hard materials such as concrete and rock.

**BACKGROUND TO THE INVENTION**

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25 Cartridges filled with gas producing substances, such as high explosives, are widely used for the excavation of hard materials, for example in mining and the demolition of concrete structures. Such cartridges are typically inserted into a hole drilled into the material in question and later ignited.

It is often necessary to use a number of cartridges in each hole to generate the required amount of energy to break the material. At present this is achieved by sequentially inserting the cartridges into the hole. This can, however, be both  
30 tedious and inefficient as it often occurs that operators do not remember how many cartridges have been inserted into the hole and consequently either insert too few or too many cartridges.

In this specification "cartridge" denotes any container for insertion into a hole  
35 formed in a hard material for the purpose of assisting in breaking or fracturing such material irrespective of the contents of the container.

5 Furthermore, in this specification "gas producing substance" means any substance which can be activated to result in the production of large volumes of gas and includes explosives, propellants and similar substances which can undergo a rapid transformation from either a solid or liquid to a gas.

10 **OBJECT OF THE INVENTION**

It is an object of this invention to provide a cartridge system which will, at least partially, alleviate some of abovementioned problems.

15 **SUMMARY OF THE INVENTION**

In accordance with this invention there is provided a cartridge system comprising at least two elongate cartridges and at least one connector element shaped to receive an end of each of a pair of cartridges to secure the cartridges end to end.

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Further features of the invention provide for the or each connector element and each cartridge to have complementary interlocking formations; for each cartridge to have an interlocking formation at each end thereof; and for each connector element to provide a pair of oppositely disposed interlocking formations.

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Still further features of the invention provide for the interlocking formations to provide a spigot socket fit; and for the interlocking formations to include inclined teeth to prevent separation of the formations once engaged.

30 Further preferred features of the invention provide for the cartridges to be filled with a gas producing substance or stemming material; for the cartridges to be rigid or flexible; for the cartridges to be part circular in cross-section; and for the cartridges to be formed from a plastics material.

- 5 A still further preferred feature of the invention provide for at least one of the formations on a cartridge to be engageable by a cartridge extraction tool.

The invention also provides a connector element for use in a cartridge system substantially as defined above.

10

The invention further provides a cartridge for use in a cartridge system substantially as defined above.

15 **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be described, by way of example only, with reference to the drawings in which:

- 20 Figure 1 is a perspective view of a first embodiment of a cartridge system; and

Figure 2 is a perspective view of a second embodiment of a cartridge system.

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**DETAILED DESCRIPTION OF THE DRAWINGS**

- A cartridge system (1) is shown in Figure 1 and includes a pair of elongate  
30 tubular cartridges (21, 22) and a connector element (25). The cartridges (25) are substantially circular in cross-section and moulded from a plastics material with spigots (23) extending centrally from each end. A central circumferential groove (24) extends about each spigot (23). A groove (28) also extends longitudinally along the outer surface of the cartridge (21) between spigots (23) and operatively

5 receives a length of shock tube (29) extending from an igniter (not shown) inserted into the cartridge (21).

The connecting element (25) has a tubular body (26) with a socket (27) in each end thereof. Each socket (27) has a radially inwardly extending circumferential lip (24A) and is configured to fit over a spigot (23) on a cartridge (21, 22) with the  
10 lip (24A) providing a snap fit in a complementary groove (24) on a spigot (23).

In use, the cartridges (21, 22) can be joined end to end by inserting a spigot (23) of one cartridge (21) into a socket (27) in the connecting element (25) until the  
15 groove (24) snaps over the lip (24A) provided in the socket (27). A spigot (23) on the other cartridge (22) is similarly secured in the opposite socket (27) in the connecting element (25). The spigots (23) and sockets (27) thus act as interlocking formations on the cartridges (21, 22) and connector element (26). Once secured in this manner the cartridges cannot be separated without being  
20 damaged and can be inserted as a unit into a hole (not shown). The groove (28) assists in preventing the shock tube (10) from being pinched between the cartridge (21) and the sides of the hole.

In this embodiment the cartridge (21) is rigid and filled with a propellant mixture  
25 (not shown) while the sides of the cartridge (22) are flexible and a cartridge (22) filled with a particulate stemming material (not shown). A number of propellant filled cartridges can thus be joined to, or interspersed with, cartridges filled with stemming material in so doing simplifying the process of loading a hole with a charge and stemming material. However, all of the cartridges could be filled with  
30 a propellant or other energetic substance and an igniter could be provided for each or any of the cartridges.

A convenient and easily used cartridge system is thus provided which allows an operator to assemble a charge before insertion into a hole. The interlocking  
35 formations have the further advantage that they are easily engageable by a

5 complementary shaped cartridge extraction tool (not shown). Thus, where it is desired to remove a cartridge from a hole the tool can be inserted into the hole to engage the end of the cartridge and withdraw it from the hole. This is especially useful where misfires have occurred.

10 Being able to assemble a cartridge of a desired charge size is also particularly useful were restrictions are placed on the size or length of cartridges or on charge sizes. In certain jurisdictions onerous conditions are attached to the transport and storage of cartridges filled with explosives or propellants greater than certain predetermined dimensions. In such jurisdictions, the cartridges  
15 provided by the invention can be configured to individually comply with regulations and assembled to user requirements immediately prior to use.

It will be appreciated, however, that many other embodiments of a cartridge system exist which fall within the scope of the invention, especially as regards the  
20 configuration of the cartridges and connector element. As shown in Figure 2, the system (30) can have cartridges (30, 31) of different shapes and these need not be provided with interlocking formations at both ends. As illustrated, an end cartridge (30) is chisel shaped at one end (33) and provides a socket (not shown) at the opposite end (34) which receives a complementary spigot (35) provided by  
25 a connecting element (36) having a pair of oppositely disposed such spigots (35) separated by a flange (37). The other of the spigots is shown inserted into a complementary socket (not shown) in the end (37) of a cartridge (31) forming part of the body of the unit. The cartridge (31) also has a socket (not shown) at its opposite end (39) to the spigot (35) for receiving a spigot of a further connector  
30 element (not shown) or an end cap (40).

The chisel shaped end (33) on the end cartridge (30) assists in preventing the expulsion of particulate stemming material filling a hole when ignited and can be fitted to a charge made up of a number of cartridges forming the body of the unit.

5 The spigots (35) of connecting element (36), and that of the end cap (40), have a series of rearwardly inclined circumferential teeth (41) which operatively engage complementary teeth in a socket to prevent removal of a spigot from a socket. Also, to assist in ensuring that the grooves (42) on the cartridges (30, 31) and end cap (40) are aligned, the sides of the spigots (35) and sockets have a  
10 flattened surface (43) which ensures that parts can only have one angular orientation.

Many other cartridge configurations, and especially interlocking formation configurations exist, however, which fall within the scope of the invention and it  
15 will be further appreciated that the cartridges could contain any suitable gas producing substance or stemming material or could even be empty where a void is desired. Also, the cartridges could themselves form part of an igniter which fits into larger cartridges.

20 Furthermore, each cartridge could be fitted with an igniter and igniters could be made to be removable from the cartridges.

**5 CLAIMS**

1. A cartridge system comprising at least two elongate cartridges and at least one connector element shaped to receive an end of each of a pair of cartridges to secure the cartridges end to end.  
10
2. A cartridge system as claimed in claim 1 in which the or each connector element and each cartridge has complementary interlocking formations.
3. A cartridge system as claimed in claim 2 in which each cartridge has an interlocking formation at each end thereof.  
15
4. A cartridge system as claimed in claim 3 in which each cartridge has similarly configured interlocking formations at each end.
- 20 5. A cartridge system as claimed in claim 2 in which each connector element has a pair of oppositely disposed interlocking formations.
6. A cartridge system as claimed in claim 2 in which the interlocking formations provide a spigot and socket fit.  
25
7. A cartridge system as claimed in claim 2 in which the interlocking formations include inclined teeth to prevent separation of the formations once engaged.
- 30 8. A cartridge system as claimed in claim 2 in which at least one of the cartridges contains a material selected from a gas producing substance and a stemming material.
- 35 9. A cartridge system as claimed in claim 1 in which at least one cartridge is rigid.



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10. A cartridge system as claimed in claim 1 in which at least one cartridge is flexible.

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11. A cartridge system as claimed in claim 1 in which the cartridges are at least part circular in cross-section.

12. A cartridge system as claimed in claim 1 in which the cartridges are made from a plastics material.

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13. A cartridge system as claimed in claim 2 in which an interlocking formation on a cartridge is engageable by a cartridge extraction tool.

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14. A connector element for use in a cartridge system as claimed in claim 1 comprising a body having a pair of oppositely disposed interlocking formations shaped to be complementary to those on a cartridge.

15. A connector element as claimed in claim 14 in which each interlocking formation is a socket.

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16. A connector element as claimed in claim 14 in which each interlocking formation is a spigot.

30

17. A cartridge for use in a cartridge system as claimed in claim 1 comprising an elongate body having an interlocking formation at at least one end shaped to be complementary to those on a connector element.

18. A cartridge as claimed in claim 17 in which the cartridge has an interlocking formation at either end thereof.

5        19.A cartridge as claimed in claim 17 in which the or each interlocking  
         formation is a spigot.

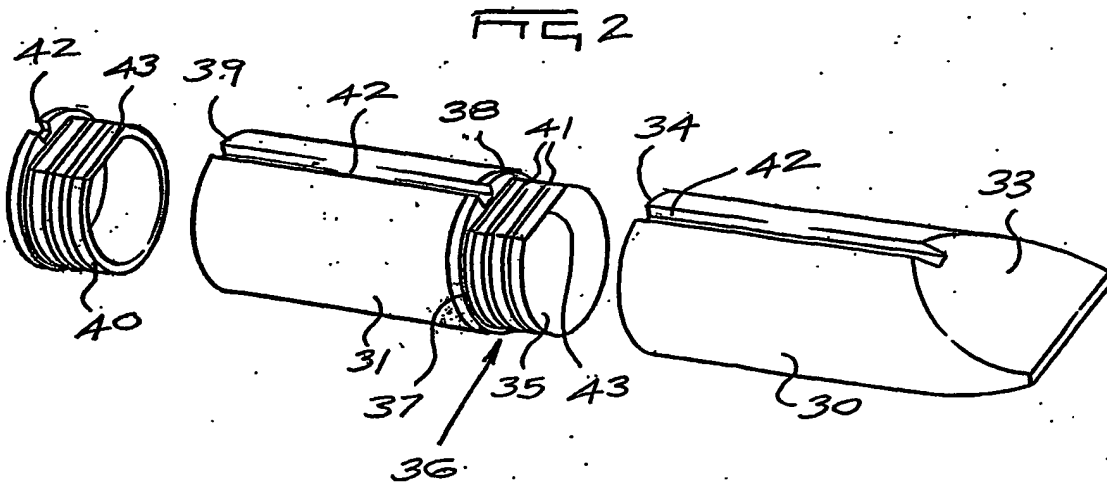
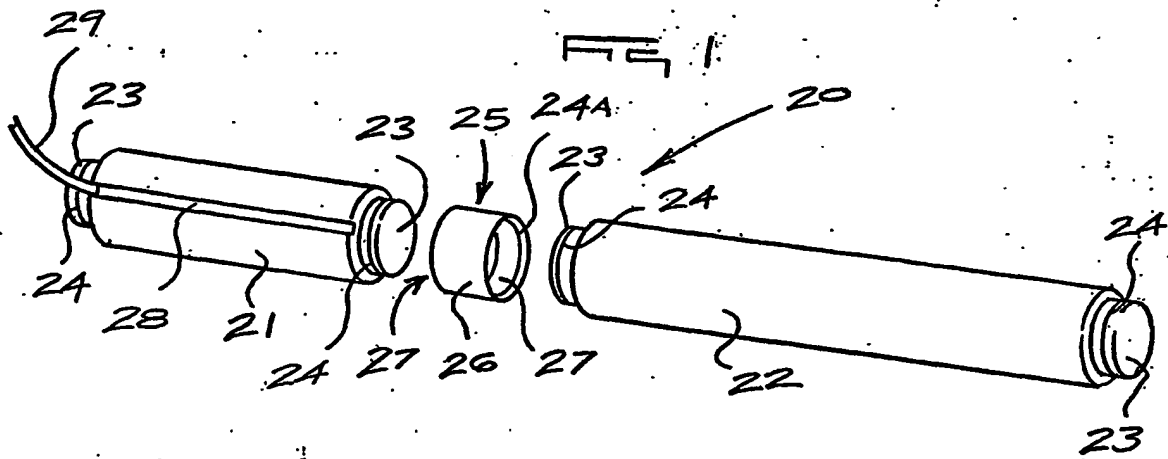
         20.A cartridge as claimed in claim 17 in which the or each interlocking  
         formation is a socket.

10

         21.A cartridge system substantially as herein described and as illustrated with  
         reference to Figure 1 or Figure 2.

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         22.A connector element substantially as herein described and as illustrated  
         with reference to Figure 1 or Figure 2.



## INTERNATIONAL SEARCH REPORT

In International Application No  
PCT/IB 02/02520A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 F42B3/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F42B F42D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 1 261 504 A (MAGER HERBERT) 19 May 1961 (1961-05-19)  page 2, left-hand column, last line -right-hand column, paragraph 2; figures 1-5	1-5, 7-12, 14, 17, 18, 21, 22
X	US 3 195 928 A (PASTERNAK HORST A G) 20 July 1965 (1965-07-20) column 2, line 56 -column 3, line 49; figures 1-5  -/-	1-14, 17-22

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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## INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 1 217 461 A (MAGER HERBERT) 4 May 1960 (1960-05-04)  page 2, left-hand column, paragraphs 3,4; figures 3,5	1-4, 8-12,14, 17,18, 21,22
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